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ABSTRACT

In this study, 120 introductory psychology students participated in an experimental game designed to be manipulated by the use of cooperative cues. These are variables introduced into a social situation that function to guide the group toward collaboration. Prior research has focused on the effect of single cues and has produced mixed results, with some studies showing cooperative cues aiding cooperation and others indicating no positive effect. Three cooperative cues, communication, trust, and equality, were examined for both their isolated and their combined influence on the proportion of cooperation and number of cooperative game outcomes in games played by triads. When each cue acted alone, none elicited a greater proportion of cooperation than did a control group with no such cue. When the cues were combined, however, there was a marked increase in both the triad's proportion of cooperation and the number of games resolved through cooperation. This cooperative behavior may have been the product of the supportive and reinforcing properties of the interdependency of cooperative cues. (Author/IS)

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Cooperation: The Synergetic Influence of Communication, Trust, and Equality on a Triad

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Abstract

A cooperative cue is any variable introduced into a social situation that functions to guide the group toward collaboration. Three cooperative cues, communication, trust, and equality, were examined in a mixed-motive situation for both their isolated and their combined influence on triads' proportion of cooperation and triads' number of cooperative game outcomes. When each cue acted alone, none elicited a greater proportion of cooperation than did a control group with no such cue. When the cues were combined, however, there was a marked increase in both the triads' proportion of cooperation and the number of games resolved through cooperation. Results were discussed in terms of cooperation being a product of the supportive and reinforcing properties of the interdependency of cooperative cues.

Cooperation: The Synergetic Influence of Communication, Trust, and Equality on a Triad

Research on group cooperation, over the last few decades, has accumulated empirical findings and a large body of literature concerning cooperative cues (Converse, 1968; Pruitt & Kimmel, 1977; Vinacke, 1969). A cooperative cue is any variable introduced into a social situation that functions to guide the group towards collaboration. The contribution that single cooperative cues such as communication, trust, and equality, have on cooperation is well substantiated (Swingle & Santi, 1972; Lindskold, 1978; Hartman, Phillips, & Cole, 1976, respectively). So rather than concentrate on cues singly, the present investigation chose to examine how three cooperative cues--communication, trust, and equality--combine to effect cooperation with the purpose of evaluating their interdependent nature.

Depending on the contextual factors of the interaction, the cooperation literature shows that cooperative cues such as communication, trust, and equality sometimes contribute to and sometimes detract from group cooperation. Concerning communication, when interactants have a common interest and the opportunity to communicate, they are likely to cooperate (Daniels, 1967; Jorgenson & Papciak, 1981; Marwell & Schmitt, 1975; Swenson, 1967; Swingle & Santi, 1972). For

situations in which interactants have attractive individualistic payoffs, however, communication serves to heighten noncooperative efforts (Deutsch & Krauss, 1960, 1962; Sherif, Harvey, White, Hood, & Sherif, 1961; Smith & Anderson, 1975). When considering the studies that demonstrate that communication can be used to disrupt cooperation (via threats and catcalls, for example), one can best conclude that communication can serve as a cooperative cue to increase cooperation, but its utility is conditional on contextual prerequites such as interactants' reciprocal motivation to use the opportunity to benefit the group.

Like communication, the utility of the cooperative cues of trust and equality is conditional on prerequisite contextual factors. When an interdependency among interactants is salient, the cue of interpersonal trust functions to direct interactants to coordinate their behaviors for mutual gain (Heilman, 1974; Lindskold, 1978; Polachek, 1980; Tedeschi, Lindskold, Horai, & Gahagan, 1969). For example, Polachek (1980) found an inverse relationship between level of international trade between nation dyads and conflict. Interdependent trade relationships serve to create an expectation for each interactant that the other will cooperate. Pruitt and Kimmel (1977) stated that such a condition that encourages a cooperative expectation fosters trust and, consequently, cooperation. However, pure trustworthiness (e.g.,

unconditional cooperation) prompts not cooperation but conflictive exploitation (Bixenstine, Potash, & Wilson, 1963; Lave, 1965; Marwell, Schmitt, & Boyes, 1973; Meeker & Shure, 1969; Shure, Meeker, & Hansford, 1965; Solomon, 1960), especially in the absence of an interdependent relationship and in the context of individualism.

Equality of resources among interactants has also been shown to function as a cooperative cue. This assertion has been demonstrated in prisoner's dilemma game matrices (Sheposh & Gallo, 1973), with mathematical models (Hunter, 1980), and with player positions in coalition games (Cole, 1970, 1972; Hartman, Phillips, & Cole, 1976). While a relatively equal power distribution inhibits conflict and facilitates cooperation, it simultaneously provides cues for conflict such as interpersonal risk and its associated feelings of uncertainty (Bueno de Mesquita, 1978). Whether an equal distribution of resources fosters cooperation or conflict depends on contextual factors such as other cooperative or conflictive cues. For example, Marwell and Schmitt (1975) have studied equal relationships in which all parties are aware of an interpersonal risk and concluded: "disruption (of cooperation) is substantial when the risk is small, almost total when the risk is large." (p. 76) Conversely, a contextual cue that often fosters cooperation with an equal distribution of resourses is communication.

Communication serves as a protective device against

interpersonal risk when it functions to establish and maintain cooperative agreements (Marwell & Schmitt, 1975). Through communication, decision-makers also increase their trust in others (Pool, 1976; Smith & Anderson, 1975; Snadowsky, 1974). Both communication and trust allow decision-makers to defer the threat of interpersonal risk in equal relationships so that cooperative intentions can be coordinated, at least when there are payoffs for such coordination. Thus, cooperative cues can acquire an interactive and supportive relationship to produce a cooperative effect on a group that is more pronounced than if these cues were isolated. Few studies have evidenced the interdependent relationship that cooperative cues have on decision-makers in cooperative dilemmas; two studies deserve attention.

Jorgenson and Papciak (1981) showed that the opportunity to communicate and feedback concerning other members' cooperative behaviors had significant main effects on increasing group collaboration. The communication x feedback interaction showed that the combination of communication and feedback produced more collaboration than either communication alone ($p < .001$) or feedback alone ($p < .001$). Thus, while both communication and feedback served as single cooperative cues, they increased cooperation even more substantially when together. A limitation on this study as it applies to increasing cooperation in a

mixed-motive dilemma is that the context of the interaction was a commons dilemma where the benefit of collaboration far outweighed the benefit of competition.

A second investigation studied decision-makers' willingness to pursue a cooperative strategy when the members had incompatible goals (Cole, 1972). Cole (1972) found that when interactants had incompatible goals, limited communication, a need for complete trust in others, and a means by which the situation could be resolved by conflict, decision-makers invariably chose the conflictive strategy. Conversely, when interactants had the same incompatible goals, an improved channel of communication, and a negation of the need to trust the other members, decision-makers chose the cooperative strategy in conflict resolution. What we can extract from these investigations is that if cooperative cues are combined rather than isolated their utility is synergistic.

Hypotheses. The present experiment addressed two hypotheses. First, it was assumed that the presence of a cooperative cue in a social situation would produce a greater proportion of cooperation than would a situation with no such cue. Therefore, it was hypothesized that each of the three social situations with one cue (communication, trust, or equality) would elicit a greater proportion of cooperation than would a social situation with no cue. Second, it was hypothesized that when all three cues were

together, they would act synergically to produce a greater proportion of cooperation than if the proportion of cooperation in the three single cue situations were added. Since, as discussed above, communication, trust, and equality are often dependent on other contextual cooperative factors to support them, an integration should occur with these cues and cooperation should be heightened.

Method

Participants. One hundred and twenty participants were recruited from introductory psychology classes at Texas Christian University. Each received course credit for participation and had the chance to earn as much as 15 dollars.

Operational Definitions of Communication, Trust, and Power. Conceptually, communication is the giving and exchanging of messages among interactants; trust is the assured reliability in another; and power is the ability to influence others. Operationally defined, communication was note passing; trust was being informed of a persons's (high) score on Rotter's (1967) Interpersonal Trust Scale; and power was the number of resource points allocated to a participant at the beginning of a game. Using these three cues, five experimental conditions were constructed: (1) all cooperative cues present, (2) communication present, (3) trust present, (4) equality present, and (5) no cooperative

cue present.

To manipulate the communication cooperative cue each participant completed a "Communication Message" with three standardized options: "Let's Play", "Let's Pass', and "No Message". The experimenter took the messages and visually displayed all three messages on a display board. The display board was easily visible to all participants. When the communication cue was included, all three participants simultaneously completed and had displayed their Communication Messages before every decision. When no communication cue was included, messages were completed and were acquired by the experimenter, but they were not displayed. Thus, the opportunity for the participants to receive the messages was prevented.

For the manipulation of the trust cooperative cue, each participant received bogus feedback of the other two participants' scores on the 40-item Interpersonal Trust Scale. It was explained that the questionnaire measured the trustworthiness of a person, and feedback was designed to create the impression that the other two participants were very trustworthy. Each of the three players received a standardized scoresheet that ranged from 80 ("Very Untrustworthy") to 120 ("Very Trustworthy"). The bogus scores were marked in the "Very Trustworthy" range. When no trust cue was included, the bogus feedback was not mentioned.

For the manipulation of the equality cooperative cue, resource points were used to represent an objective, numerical categorization of power so that participants could readily identify whether the situation was an equal or an unequal one. Thus participants were not left to subjective interpretations of another participant's influence capacities. Resource points for equal and unequal power distributions were used as they are typically used in coalition formation studies. For the unequal power distribution: player A = 30 points; player B = 20 points; and player C = 10 points. In the equal power distribution, all participants were given equal influence, i.e., A = B = C = 20 points.

The Experimental Game. The experimental game was a modification of a three-person intense conflict situation characterized as a truel--a three-person duel-to-the-death (Cole, 1969, 1972; Cole & Phillips, 1970; Cole, Phillips, & Hartman, 1977; Shubik, 1954) which ends when at most one player remains. In a truel (named a "uelative" game), the object is to survive. One survives by eliminating others while not being eliminated oneself. Thus, the path to survival is an individualistic strategy of self-preservation at the expense of others.

For the present experiment, however, the uelative game was altered to include the possibility that the interactants might redefine their goals toward cooperation by allowing a

triadic team to survive so all parties could share in any achieved gain (Cole, 1970, 1972; Cole, Phillips, & Hartman, 1977). In this potential uelative game the object is still to survive, but the player has not one path to survival but two: individual survival or group survival.

The group survival (cooperative) alternative allowed players to try to enter into a no-attack triadic team. For the present study, two-person coalitions were not allowed. The only team attainable was one which included all three persons. The rationale behind this position was that a two-person team within a triad does not qualify as a cooperation. A two-person coalition is not a cooperative agreement because it allows two players to gain at the expense of the third.

At the beginning of each game each player was randomly allocated two types of resource points: a defense and an attack. The number of defense points a player was allocated depended on the manipulation of the equality cue (unequal: A = 30; B = 20; and C = 10 or equal: A = B = C = 20). The number of attack points for each player in each condition was always four. For every condition the number of attack points was a constant for each player (A = B = C = 4 attack points), while the number of defense points was dependent on the experimental condition. The attack points were perpetual; the defense points were a resource to be subtracted from. On each turn of the game, each player

independently made a decision whether to attack one of the other two players or to select the no-attack pass option. By attacking, a player employed attack points to subtract four points from the attacked player's total defense points. Whenever players had their defense point totals diminish to zero, they were eliminated from that game. By passing, players forfeited the use of attack points for that decision turn and qualified as members of a no-attack triadic team. Such a team was formed whenever all three participants passed together for two consecutive turns (Cole, 1970; Willis & Long, 1967). Choosing to attack was defined as a competitive decision, and choosing to pass was defined as a cooperative decision.

Procedure. The 120 participants formed eight groups with 15 participants per group. As each of the eight groups arrived at the appointed time, the 15 participants met together in one large room. In this room each participant initially completed the Interpersonal Trust Scale, or ITS, (Rotter, 1967).

After all 15 participants completed the ITS, the supervising experimenter announced that the ITS was going to be used further in the experiment and that he had to leave for a moment to take the questionnaire to the computer center to be scored. When he returned, each participant was handed an index card with a subject number and a room rotation schedule. The room rotation schedule consisted of

five room assignments for the play of five games for each participant. By having participants play games with different players, they were not making decisions based on personal associations or "tit for tat" strategies. Also, the rotation was used to randomize the sequence in which the participants played the five variations of the experimental game. There was one room for each of the five experimental conditions. For the first game there was one triad in each of the five rooms. For the second game, all 15 participants changed rooms and changed playing partners. The rotation followed accordingly for games three, four, and five.

After the index cards were distributed, the experimental game and its instructions were introduced. The 15 participants were informed that they would participate in five slightly different games in five different rooms, play five slightly different games, and that some aspects of the game would vary from one room to the next. The rotation schedule was explained with the primary emphasis being that no participant would play with any other participant more than once, and that no participant would play more than once in any room.

As announced in the instructions, there were two ways to win: individually or three-person team. The instructions informed the participants of the value of winning both as an individual and as a three-person team (two-person teams were explicitly disallowed). An individual winner was to be

awarded 100 pennies and each member of a three-person team 33 and a third cents. After each player had played five games and accumulated earrings, incentive bonuses were to be awarded. For the individual who earned the most money over the play of the five games, that person's earnings were tripled. For the individual who earned the second most money, that person's earnings were doubled. The incentives insured that players in the mixed-motive game would be motivated to try to maximize their winnings.

The supervising experimenter escorted the 15 participants to the experimental setting, and each participant was individually directed to his or her first room assignment. In each of the five rooms was a rectangular table (approximately 3 x 6 feet) with three chairs along one side of the table. Each chair was in a booth, which was constructed so that participants could be seated side-by-side without seeing one another. All had a clear view of a display board in front of them. On the tabletop of the three booths lay three index cards and a stack of Communication Messages (1 x 2 inches). On the three index cards were the participant's response options. Each player had only the cards needed to attack the other two players (Attack B, Attack C; Attack A, Attack C; Attack A, Attack B for players A, B, and C respectively) and the card to pass.

The three booths faced the display board, which was

labelled "Communication Board", a computer screen, and an experimenter, one of six graduate students all of whom were blind to the experimental hypotheses. The experimental game was played on the computer screen. The screen displayed each player's attack and defense points at the beginning of each game and the results after each turn of play. By using the index cards, the participants communicated their decisions to the experimenter nonverbally. The experimenter then typed the decisions in the computer, the results appeared on the screen, and the later turns of play followed.

After each game, the supervising experimenter re-escorted each participant into a second room assignment where the same procedure was repeated until all participants had played five games. The rooms and the experimenters in the rooms were counterbalanced among the eight sessions. At the completion of the room rotations, the supervising experimenter asked the group of 15 participants to return to the initial meeting room. Once congregated, participants were paid their earnings and concurrently debriefed.

Results

The two experimental hypotheses were (1) while not differing from one another, the Communication, Trust, and Equality conditions would all produce significantly greater proportions of cooperation than would the None Present,

control condition, and (2) the proportion of cooperation in the All Present condition would be significantly greater than the sum of the proportion of cooperation in the Communication, Trust, and Equality conditions. A cooperative decision was defined as choosing the pass option and a noncooperative decision was defined as choosing the attack option. Proportion of cooperation was calculated for each triad by dividing the number of pass decisions by the total number of decisions (i.e., passes / passes + attacks). The dependent measure, then, was the triad's proportion of passes. It was necessary to exclude two of the groups of 15 participants from the analyses because an experimenter failed to apply the scheduled treatment. Thus, the results concern six sessions and, therefore, 90 participants. Concerning the triad's proportion of passes, there were no effects among experimenters ($F(5,144) = 1.14$, NS), no effects among the five rooms ($F(4,145) = 0.94$, NS), and no effects among the six sessions, i.e., group of 15 participants, ($F(5,144) = 1.59$, NS).

Table 1 shows the proportion of pass decisions for each of the five experimental conditions. A one-way analysis of variance of the data summarized in Table 1 revealed a significant difference among the conditions, ($F(4,145) = 4.34$, $p < .002$). A post hoc test, Tukey HSD (Kirk, 1982), demonstrated that the All Present condition produced significantly more pass decisions than the other four

conditions, and that the other four conditions did not differ from one another. Since the latter four conditions did not differ from one another, the hypothesis that the situations with one cooperative cue (Experimental conditions 2, 3, and 4) would produce a greater proportion of passes than the situation with no cue (None Present) was not supported. Further, an inspection of Table 1 shows that the All Present condition did not produce a greater proportion of passes than the sum of the three single cue conditions (Mean of All Present = .310; Sum of the means of Communication + Trust + Equality = .136 + .132 + .154 = .512).

Table 1

Mean Proportion of Passes by Experimental Condition

Condition	Proportion of Passes		
	X	SD	n(a)
All Present	.310	.318	30
Communication	.136	.196	30
Trust	.132	.123	30
Equality	.154	.125	30
None Present	.133	.187	30

(a) Number of triads per condition.

There was support for the second, or synergetic, hypothesis. It stated that cues combined, rather than isolated, would produce a qualitatively different social situation that was much more likely to produce cooperation than the single cue conditions. None of the three single cue conditions was able to elicit more cooperation than the None Present, control condition. Thus, the impact of one cooperative cue when isolated was, at best, minimal. When these cues were together, however, there was a marked increase in cooperation.

Initially, single cue conditions should elicit cooperation, but, being dependent on contextual factors for support will gradually, over time, deteriorate to a None Present-type condition. Conversely, when cues are combined, they should be able to reinforce one another and therefore maintain cooperation over time. Figure 1 shows the

proportion of passes elicited by each condition as the turns of the game progressed. Participants played the game until one of two outcomes was reached: either all three agreed to form a three-person no-attack team or at least two of the players had been eliminated. The mean number of decision turns for a triad was 5.65 (range: 2 to 9 turns). So each decision turn could be allotted a comparable number of cases, the sixth through the ninth turns were aggregated and reported as 'Decision 6 thru 9' (only four of the 150 games went past seven turns).

Figure 1

Triads' Mean Proportion of Passes for the Five Conditions Across Decision Turns in the Game

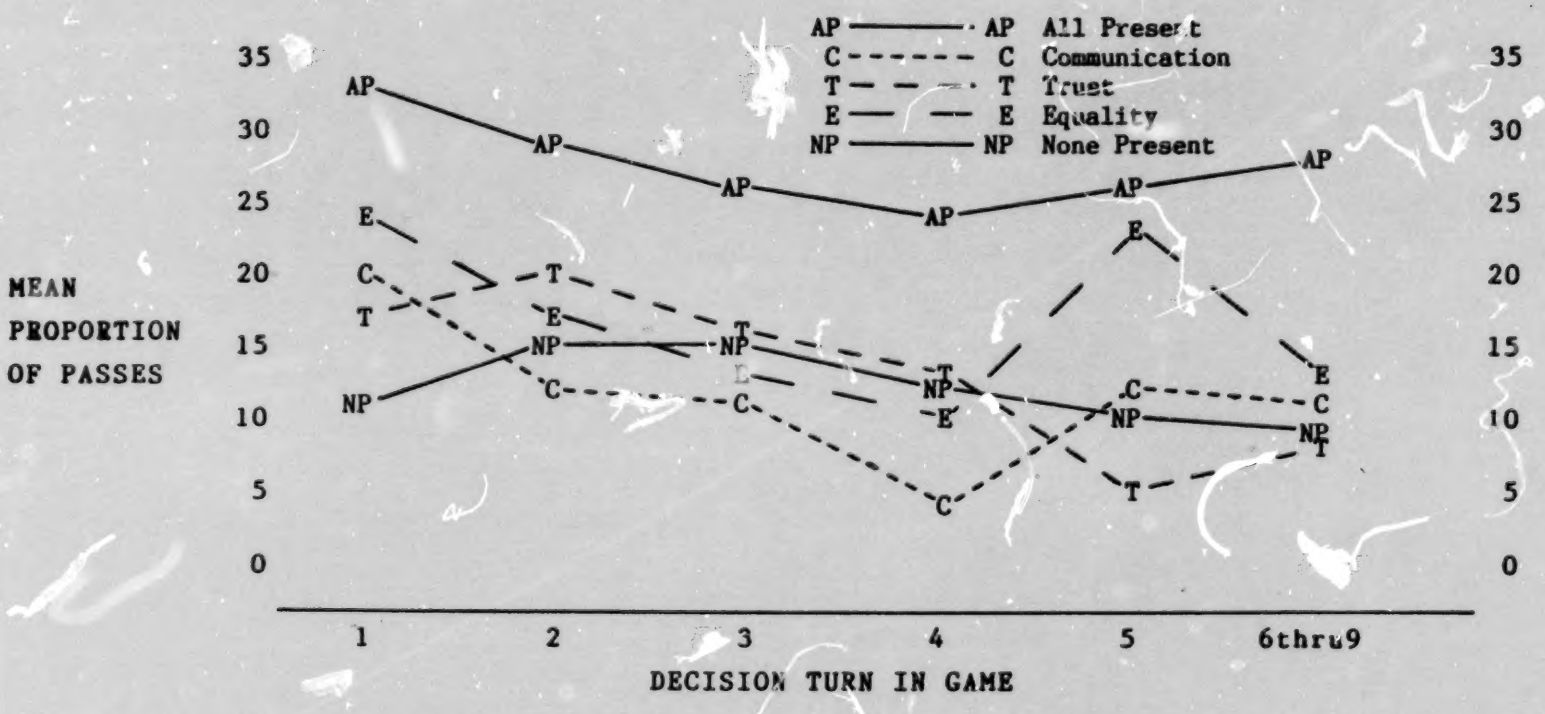
AP AP All Present
C C Communication
T T Trust
E E Equality
NP NP None Present
MEAN PROPORTION OF PASSES
35
30
25
20
15
10
5
0
1
2
3
4
5
6thru9
DECISION TURN IN GAME

Figure 1 is important for three reasons. First, it is clear that the All Present condition elicited a greater proportion of passes than the other four conditions regardless of the stage (decision turn) of the game. Second, the proportion of passes in 'Decision 1' approximated the first experimental hypothesis, i.e., All Present > Communication = Trust = Equality > None Present. On decision one there was a significant difference among the groups, $F(4,145) = 3.10$, $p < .02$, but a Tukey HSD test revealed that the only significant difference was between the All Present condition and the None Present condition. Third, there was an upward tendency in the curve for the All Present condition at the end of the game that was not evident in any of the other four conditions. Apparently, near the end of the game, the only condition in which the triad was able to rely on the cooperative option to resolve the conflict was the All Present condition.

The clearest support for the synergetic hypothesis was revealed by examining the outcome of the games. There were two alternative game outcomes: cooperative, i.e., three-person team; or conflictive, i.e., one or no survivor. Table 2 shows the game outcomes, either cooperative or conflictive, for the 30 triads in each of the five conditions. A Chi-square test for independence between outcome and experimental condition was done for each of the five conditions. For each of the five Chi-square tests the

average number of cooperative outcomes of all the conditions (13 total cooperative outcomes / 5 conditions = 2.60) served as the expected value. Game outcome was found to be dependent on experimental condition for one condition. The All Present condition produced significantly more cooperative game outcomes than expected (χ^2 (1) = 12.26, $p < .001$). The other four conditions did not produce a different number of cooperative game outcomes than expected (Communication, χ^2 (1) = 1.07, NS; Trust, χ^2 (1) = 1.07, NS; Equality, χ^2 (1) = 0.14, NS; and None Present, χ^2 (1) = 1.07, NS).

Table 2

Number of Cooperative and Conflictive Game Outcomes and Chi-square Values with Levels of Significance for the Five Experimental Conditions

	Game Outcomes			
Condition	Number of Cooperative Outcomes	Number of Conflictive Outcomes	Chi-Square	Sign
All Present	8	22	12.26	.001
Communication	1	29	1.07	NS
Trust	1	29	1.07	NS
Equality	2	28	0.14	NS
None Present	1	29	1.07	NS
All Conditions (Expected Values)	13 (2.6)	137 (27.4)		

There were 30 games in each of the five conditions.

Discussion

The results of the present study produced two interesting findings concerning the factors that induce cooperation in a potentially uelative social situation. First, the All Present condition elicited a greater proportion of passes than the other four conditions, none of which was shown to differ from any other. Second, when the index of cooperation was the outcome of the game, the All Present condition also was much more likely to elicit a cooperative outcome than were the other four conditions.

The simultaneous presence of three cooperative cues in a social situation was able to create an integrative, synergetic effect on the triad. The finding that the single cue conditions had a minimal effect on cooperation can be interpreted by acknowledging that these social situations are qualitatively comparable to the None Present situation, at least in the present study's mixed-motive situation. The All Present condition, however, seemed to be qualitatively different from the other conditions. Even though none of the single cues were able to induce cooperation, these same cues together were able to induce cooperation.

One question that needs to be addressed is why were the cooperative cues of communication, trust, and equality, all of which are substantiated to be cooperative cues in the cooperation literature, ineffective in the present study

except in combination? The answer is that the cues were effective at the beginning of the game, i.e., on decision one. Figure 1 showed that on decision one the communication, trust, and equality cues all tended to elicit a greater proportion of cooperation than the no cue condition. But as the turns of the game progressed, the utility of each cooperative cue in isolation diminished. The communication cue is illustrative because the opportunity to communicate promoted cooperation initially but after decision one, the opportunity to communicate by itself was actually counterproductive. Thus, communication was a potential, i.e., a conditional, cooperative cue: by itself it promoted some noncooperation much like the Deutsch and Krauss investigations; together with trust and equality it promoted cooperation much like the cooperation literature would suggest.

As stated in the introduction, the synergetic hypothesis was that the All Present condition would elicit more cooperation than would the three single cue conditions when added. This, of course, is a sum is greater than its elements rationale. The synergetic hypothesis, as these results indicate, needs to be restated in terms of the utility of individual cooperative cues when in the context of other cooperative cues. Communication, trust, and equality acting alone in a mixed-motive situation were not able to elicit cooperation, but these cues were able to

produce cooperation when combined. It is clear that none of the three cooperative cues was responsible for the increased cooperation in the All Present condition because the proportion of cooperation in the single cue conditions was virtually identical to the proportion of cooperation in the no cue (None Present) condition. Cooperation was a product of the supportive and reinforcing properties within the interdependency of the three cues.

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